Original Articles

SPASMODIC VASO-MOTOR DISTURBANCES OF THE RESPIRATORY TRACT, WITH SPECIAL REFERENCE TO HAY FEVER.

A Preliminary Report.

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The consensus of opinion put forward within the past two years, as is shown in the literature, seems to indicate definitely that spasmodic vaso-motor disturbances of the nose, including hay fever and asthma likewise, are all anaphylactic or sensitized states, due to proteid poisoning of bacteria, food products, pollens, animal dandruff and animal hair. There also seems to be increasing evidence showing the influence of endocrine glands, especially the adrenals, as well as the sexual glands, thyroid and possibly the pituitary.

Beck, in a recent article on "Relation of the Glands of Internal Secretion in Oto-Laryngology," speaks of hyperplastic ethmoiditis, a condition accompanied by marked irritability of the nasal mucous membrane, with sneezing and hypersecretion, as a rarefying process, the result of a primary infection, plus a dysharmony of one or more of the internal glands. He also states definitely that he has not seen any permanent results from surgical procedure alone. This latter point will be referred to later, when discussing hay fever, also personal experiences with evident internal gland disorders will be shown when reporting cases of spasmodic sneezing in its relation to bacterial proteid and food proteid absorption.

There seems to be a misconception among many medical men as to the underlying factors in vaso-motor disturbances of the upper and lower air passages.

This schematic drawing taken from Falta's work on the "Ductless Glandular Disturbances" is to illustrate the origin and distribution of the autonomic nervous system.

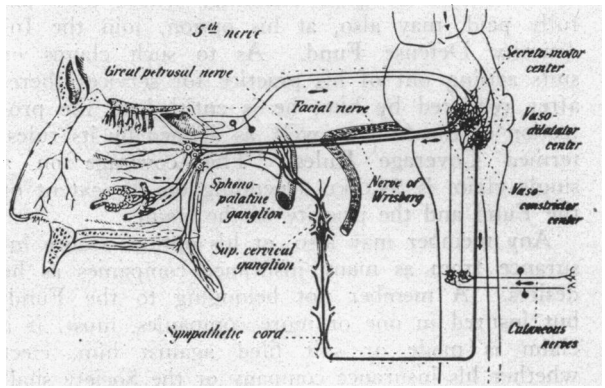

Chart No. 2 is taken from Brubaker's article in the Transactions of the American Laryngological Association, 1916, showing the relationship of the medulla with the nose (the afferent and efferent fibres). A careful study of the original article gives a clearer understanding of the reflexes than any article that has yet been published in American literature.

Inasmuch as vaso-motor instability appears to be the key to the situation, it therefore seems expedient to refer briefly to the anatomy of the vegetative portion of the nervous system. The vegetative system, consisting of the autonomic and sympathetic portions, has its origin in the brain and spinal cord. The sympathetic begins at the second thoracic and extends downward to include the second lumbar, while the autonomic arises partly in the brain stem and from the sacral region of the cord. The autonomic fibres of the third go to the ciliary ganglion and the seventh, ninth, tenth and eleventh

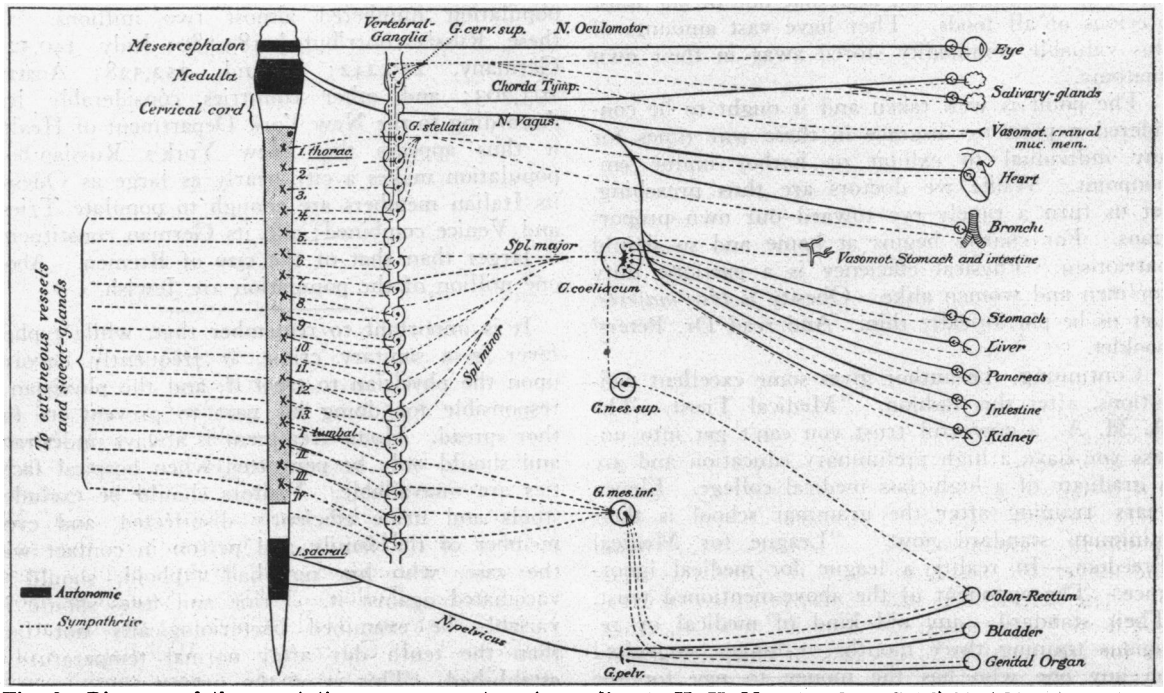

Fig. 2.—Diagram of the vegetative nervous system (according to H. H. Meyer and R. Gottlieb). The autonomous innervation is black, the sympathetic broken lines.

cranial go to the nasal ganglion (the spheno-palatine) and from thence innervate the blood supply of the entire nose, sinuses, heart, bronchi, stomach and intestines. The first, second and third sacral, through the pelvic plexus, supply the lower colon and other pelvic contents, including the genital organs (J. S. Frazer, Nasal Neurosis, Edinburg Med. Journal, August, 1917). It has been stated that it is impossible to separate the autonomic from the sympathetic; that they are antagonistic to each other, but that there should be an equal balance between them in order that the organs supplied should functionate properly; that if the autonomic side is over activated or irritated by some substance, i. e., secretion from some endocrine gland or protein, we have a vagatonia with excessive secretion and spasm; that if the sympathetic side is overactivated we have a sympatheticotonia with no secretion and relaxation. In other words, spasmodic affections of the respiratory tract, hay fever, true or false, as well as asthma, come under the group of vagatonias and the ordinary vaso-motor rhinitis with alternating stoppage of the nose accompanied by relaxed membrane and no discharge, comes under the group of sympatheticotonias.

It therefore seems to me that there must be a state of general hypersensitiveness due either to hereditary abnormalities in the endocrine glands, syphilis or focal infections, before local hypersensitiveness can develop in the nose. The local hypersensitiveness may be influenced by nasal abnormalities or deflected septa, but according to hay fever workers, Goodale, Oppenheim, Scheppegrell and others, this is rarely, if ever, true in pollinosis. Repeated doses of tox-albumin or proteids, be they pollens, food or animal hair proteids, seem necessary before local hypersensitization is accomplished.

This brings us to the consideration of the grouping of spasmodic vaso-motor disturbances, or anaphylaxis of the air passages into three types:

* 1. Inspired,
2. Ingested,
3. Bacterial.

The *inspired* are pollens, proteid particles from the air or dandruff of animals, horses, cats, dogs, sheep, cattle, guinea pigs and chicken feathers, face powders, orris root, flour, etc.

The *ingested* cover the entire group of foodstuffs, fruit, vegetables, breadstuffs, animal food, sea products, nuts, beverages, as coffee, tea, chocolate and alcohol.

The *bacterial,* focal infections from accessory sinuses, tonsils, teeth, gallbladder, appendix, intestines, etc. *

REASONS FOR TAKING UP THE WORK.

About three years ago, following the reading of Goodale's article on "Anaphylactic Reactions in Horse Asthma and Allied Conditions," Talbot's article on "Egg Poisoning" and Cook's article on "Hay Fever," I became interested in the study of spasmodic vaso-motor disturbances of the upper and lower air passages. Shortly after the study of these articles I had a conversation with a Southern Pacific engineer referred from Los Angeles for treatment as to his lack of efficiency during the supposed hay fever period. As a result of that conversation I concluded there was a decidedly economic side to the hay fever question, in so far as it concerned the Southern Pacific Company, and I therefore asked my chief, Dr. Frank Ainsworth, if he would send a circular letter out to the hospital staff of the entire system, to determine if possible the number of hay fever victims among the railroad employees reporting yearly for relief. It was found that five hundred cases reported yearly, and of this number about two hundred were located in California. These reports suggested that the statement made to the President of the American Hay Fever Prevention Association by the California State Board of Health was incorrect, that hay fever in the state was rare. True, it is difficult to get any idea of the percentage of population in the state who are hay fever sufferers and to what type (spring or fall) they belong. Apparently, however, the early spring cases are more common, especially in the towns of Chico, Woodland, Colusa and Oroville, while in the lower San Joaquin Valley the late summer and fall type seems to predominate. From the wide distribution and profusion of the flora, it suggests that the percentages will increase when the non-bacterial types of colds are studied more closely and when true hay fever sufferers are shown that some relief can be given them.

From the reports received, answering, "what plants were thought to be responsible for hay fever," the following grasses and plants were reported:

Blue grass, Johnson grass, velvet grass, orchard grass, timothy, wild oats, alfalfa, greasewood, giant ragweed, common ragweed, sagebrush, figweed, dandelion, locust, roses, lily-of-valley, orange, olive, sweetpea, mustard, tarweed, sunflower, coreopsis, clover, willow, wall flower, asparagus plant, tree of heaven, pines, almonds, prunes, cottonwood, balm of Gilead—32 in all.

The work of eastern men (Goodale, Oppenheim) suggests that the following list submitted by Cooke represents the hay fever producing plants in the eastern states. He divides them as follows:

Type A. Grammaceæ, timothy, wheat, red top, low spear, sweet vernal, mullein, rye.

Type B. Flowers, rose, daisy, lilac, dandelion.

Type C. Trees and shrubs, locust, chestnut, pine, maple, privet.

Fall type. Ragweed, goldenrod, aster, chrysanthemum, nasturtium, clematis, spartina, sticata.

A careful study of the above lists forced me to the conclusion that the only satisfactory way to determine the flora responsible for hay fever in the west was to have made a careful botanical survey of the districts in California and Nevada where hay fever was known to exist, and I therefore first sent in July, 1916, a third year student of botany into the districts of Bakersfield, McKittrick and Hanford. The result of this study covered one hundred and twenty plants, grasses and shrubs. Following this, in September, 1916, I sent Professor Hall, Chief of Botany at the University of California, to Woodland, Colusa and Chico, where he made a very careful survey of the late summer and fall flora. In April of this

* This compilation was made up from the Boston Medical and Surgical Journal.

year a similar survey was made of this same district for the spring flora. In June, July and August, 1917, a survey of Nevada was made by Professor Hall which included the districts of Reno, Goldfield, Tonopah, Elko and Ogden, Utah, and the S. P. right of way from Benicia to Ogden.

During the past winter a compilation of one hundred and twenty of the western flora was made, showing the known habitat of each, from the Mexican border to the Canadian line and from the Pacific Coast to Colorado. This vast and comprehensive work was done by Professor Hall and presented to me for the good of the cause.

It is now pretty generally understood that pollen fertilization is air borne, or insect carried. Dr. Scheppegrell, President of the American Hay Fever Prevention Association, has in his writings shown very clearly that the air-borne pollens are the principal offenders and that many of Cook's and Goodale's lists have little to do with the causing of hay fever except by direct inhalation of the pollen from the flowers. It is therefore to this class of air-borne pollen producers that our efforts have been directed during the past two years.

The western states seem in comparison to the eastern states in the production of hay fever provokers, to have been the dumping ground of the world so far as the flora go; and we have found in our botanical studies and biological tests several blue ribbon winners among the pollens as compared to the eastern ones, when it comes to their toxic properties.

The following is the list as compiled by Professor Hall of the most important hay fever producing trees, grasses and shrubs:

Coniferae.
Cupressus, cypress (wind borne).
Juniperus, including sabina, junipers (wind borne).
Pinus, many species, pines (wind borne).

Gnetaceae.
Ephedra nevadense, desert tea (wind borne).

Zygophyllacea.
Larrea tridentata, creosote bush (insect borne).

Salicaceae.
*Populus fremontii, fremont cottonwood (wind borne).
Salix, many species, willow (insect borne).

Cupuliferae.
Quercus, oak (wind borne).

Leguminosae.
Robinia pseudacacia, locust tree.

Polygonaceae.
Rumex conglomeratus, clustered green dock (wind carried).
Rumex crispus, curly dock (wind carried).

Cyperaceae.
Scirpus lacustris, tule (wind carried).
Scirpus robustus, bulrush (wind carried).

Juglandaceae.
*Juglans hindsii, Northern Cal. black walnut.

Gramineae (all wind carried).
Agropyron pseudorepens, false couch grass.
*Agrostis alba, red top.
*Andropogon halepense, Johnson grass.
*Avena, oats.
*Bromus villosus (maximus), broncho grass, or needle grass.
*Cyndon dactylon, Bermuda grass.
*Dactylis glomerata, orchard grass.
*Distichlis spicata, salt grass.
*Elymus condensatus, giant rye grass.
*Elymus triticoides, slender wild rye.
Gastridium lendigerum, nit grass.
*Lolium perenne and varieties, ray grass.
*Phleum pratense, timothy.
Sporobolus asperifolius, rough leaved salt grass.
Sporobolus depacuperatus.

***Chenopodiaceae** (supposed to be wind carried, but possibly by minute insects).
Atriplex bracteosa, salt bush (that from Woodland is same as atriplex rosea, red orache).
Atriplex canescens, shad scale.
Atriplex species, salt bushes.
*Chenopodium album, lamb's quarters or white goosefoot, or pigweed.
Chenopodium ambrosiodes, Mexican tea.
Chenopodium anthelminticum, wormseed.
Grayia spinosa, hop sage.
Salicornia species, pickleweed.
*Salsola kali, Russian thistle.
*Sarcobatus, vermiculatus, black greasewood.
*Spirostachys occidentalis, iodine bush.
Suaeda species, sea blite, alkali blite.

Urticaceae.
Urtica holosericea, creek nettle (wind carried).

Amaranthiceae.
*Amaranthus graecizans, tumbleweed (wind carried).
*Amaranthus retroflexus, rough pigweed (wind carried).

COMPOSITAE.

Mayweed Tribe.
Artemisia dracunculoides, Indian hair tonic (wind carried).
Artemisia absinthium, European wormwood (wind carried).
Artemisia biennis, biennial wormwood (wind carried).
*Artemisia californica, California old man (wind carried).
Artemisia frigida, pasture sagebrush (wind carried).
*Artemisia heterophylla, mugwort (wind carried).
*Artemisia ludoviciana, mugwort (wind carried).
Artemisia spinescens, bud brush (wind carried).
*Artemisia tridentata, sagebrush (wind carried).
*Achillea millefolium, yarrow (insect carried).
Anthemis cotula, mayweed or dog fennel (insect carried).

Ragweed Tribe.
*Ambrosia psilostachya, western ragweed (wind carried).
Dicoria canescens (wind carried).
Franseria chamissonis (wind carried).
Franseria bipinnatifida (wind carried).
Franseria dumosa, sand bur (wind carried).
*Franseria tenuifolia (wind carried).
*Hymenoclea salsola (wind carried).
*Iva axillaris, povertyweed, western elder (wind carried).
Iva nevadensis, Nevada ragweed (wind carried).
*Iva xanthifolia (wind carried).
*Xanthium pennsylvanicum, cocklebur (wind carried).
*Xanthium spinosum, spiny clotbur (wind carried).
Franseria acanthicarpa, false ragweed (wind carried).

Aster Tribe.
Solidago californica, Calif. goldenrod (insect carried).
Aster exilis, slim aster (insect carried).
Chrysothamnus nauseosus, rabbit bush (insect carried).
Grindelia camporum, gum plant (insect carried).
*Heterotheca grandiflora, telegraph plant (insect carried).
Isocoma veneta acradenia (insect carried).
Monoptilon hellioides, desert aster (insect carried).
Solidago occidentalis, western goldenrod (insect carried).

Sunflower Tribe.
Encelia eriocephala, desert sunflower (insect carried).

Helianthus annuus, sunflower (insect carried).
Bidens pilosa, beggar ticks (insect carried).
Bidens vulgata, beggar ticks (insect carried).

Sneezeweed Tribe.

Helenium puberulum, sneezeweed (insect carried).
Baeria chrysostoma, goldfields (insect carried).

Tarweed Tribe.

Centaurea melitensis, Napa thistle (insect carried).
Centrodamia fitchii, Fitch's spikeweed (insect carried).
Centromadia pungens and var. parryi, spikeweed (insect carried).
Hemizonia fasciculata, ramosissima (insect carried).
Hemizonia heermannii (insect carried).
Hemizonia luzulaefolia, hay field tarweed (insect carried).
Hemizonia virgata, virgate tarweed (insect carried).
Madia elegans, madia (insect carried).
Madia sativa, Chile tarweed (insect carried).
Centaurea melitensis, Napa thistle, tarweed (insect carried).
Centaurea acanthicarpa, false ragweed (insect carried).

Note—Those marked * have been tested out and found positive.

POSSIBLE HAY FEVER PLANTS, OF SECONDARY IMPORTANCE.

1. COMPOSITAE.

Artemisia cana, especially in Rocky Mountain states.
Artemisia canadensis, especially in Rocky Mountain states.
Artemisia discolor, especially in Rocky Mountain states.
Artemisia pycnocephala, along the coast.
Artemisia rigida, especially in Eastern Nevada.
Baccharis pilularis, coast hills.
Baccharis viminea, guatemote.
Coreopsis species, related to **Bidens.**
Erigeron canadense, horseweed, probably by direct inhalation only.
Franseria, a few additional species in Southern California.
Gnaphalium (and related genera), the everlastings, are perhaps wind pollenated.

2. CHENOPODIACEAE.

Beta vulgaris, beet.
Eurotia lanata, winter fat or cotton brush, Great Basin.
Kochia americana and **K. californica,** alkali flats of the interior.
Nitrophila occidentalis, alkali districts.

3. GRAMINEAE.

Agropyron, several species in addition to the one given but not abundant.
Agrostis microphylla, small leaf, redtop.
Agrostis exarata, white top, Nevada, etc.
Beckmannia erucaeformis (slough grass).
Bromus rubena, red brome.
Digitaria sanguinalis (crab grass).
Echinochloa (barnyard grass).
Festuca spp (fescue).
Holcus lanatus (velvet grass).
Hordeum, several species, includes "Fox Tail," etc.
Leptochloa imbricata (slender grass).
Panicum pacificum (panic grass).
Pleuraphis rigida (gailleta grass), deserts.
Poa annus (walk grass).
Poa brachyglossa.
Poa buckleyana, Buckley's blue grass, especially in hay, Nevada.
Poa pratensis (Kentucky blue grass).
Puccinellia airoides (alkali meadow grass), deserts and Nevada.
Sitanion, several species, usually scattered but reported common in Goldfield.

Many more grasses occur and may be important locally, but not abundant over large areas. In addition, the following cultivated grasses should be considered: Timothy, red top, oats, wheat, rice, rye, barley, indian corn, and kaffir corn.

CLASSIFICATION OF GRASSES.

1. **Corn Tribe.**
   Indian corn (zea mays).
2. **Sorghum Tribe** (andropogoneae).
   Sorghum (andropogon sorghum).
   Johnson grass (andropogon halepensis).
   Sudan grass (andropogon sorghum var.).
3. **Zoysia Tribe** (zoysieae).
   Gailleta grass (pleuraphis rigida).
   Curly mesquite (hilaria cenchroides).
4. **Millet Tribe** (paniceae).
   Crab grass (digitaria sanguinalis).
   Knot grass (paspalum distichum).
   Barnyard grass (echinochloa crus-galli).
   Millet, kaffir corn, etc. (panicum spp.).
   Bur grass (cenchrus tribuloides).
5. **Rice Tribe** (oryzeae).
   Rice (oryza sativa).
   Wild rice (zizania aquatica).
6. **Canary Grass Tribe** (philarideae).
   Canary grass (phalaris canariensis).
7. **Bent Grass Tribe** (agrostideae).
   Red top (agrostis alba).
   White top (agrostis exarata).
   Timothy (phleum pratense).
   Tawny beard grass (polypogon monspeliensis).
   Water beard grass (polypogon littoralis).
   Nit grass (gastriduim lendigerum).
   Bunch grass (stiba pulchro and others).
   Rough leaved salt grass (true salt grass in Tribe X), (sporobolus asperifolius).
8. **Oats Tribe** (aveneae).
   Oats (avena sativa).
   Wild oats (avena fatua and barbata).
   Velvet grass (holcus lanatus).
9. **Finger Grass Tribe** (chlorideae).
   Bermuda grass (cynodon dactylon).
   Slough grass (beckmannia erucaeformis).
   Grama grasses (bouteloua spp.).
   Slender grass (leptochloa imbricata).
10. **Fescue Tribe** (festuceae).
    Fescue grass (festuca spp.).
    Salt grass (distichlis spicata).
    Orchard grass (dactylis glomerata).
    Blue grass (poa pratensis).
    Walk grass (poa annua).
    Brome grass (bromus tectorum).
    Broncho grass or needle grass (bromus villosus).
    Red brome (bromus rubens).
    Low tridens (tridens pulchellus).
    Alkali meadow grass (puccinellia airoides).
*11. **Barley Tribe** (hordeae).
    Barley (hordeum vulgare).
    Barley grass (erroneously called Fox Tail), (hordeum murinum).
    Ticklegrass or Squirrel Tail (hordeum jubatum).
    Meadow wild barley (hordeum nodosum).
    Rye grass (lolum perenne).
    Wheat (triticum aestivum).
    Slender wheat grass (agropyron tenerum).
    Rye (secale cereale).
    Giant wild rye (elymus condensatus).
    Glaucous wild rye (elymus glaucus).
    Slender wild rye (elymus triticoides).
    Sitanion (sitanion spp.).

S. P. RIGHT OF WAY.

Sacramento Valley.

Spring:
Sitanion,
Dock,
Wild oats,
Barley grass,
Meadow barley grass,
Bunch grass,
Needle grass,

Soft cheese,
Canary grass,
Ray grass,
Johnson grass,
Bermuda grass,
Povertyweed,
Cottonwood.

Summer and Fall:

Mugwart,
Ragweed,
Cocklebur,
Lamb's quarters,
Russian thistle,
Salt bush,
Salt grass,
Povertyweed.

MODESTO.

Spring and Early Summer:

Johnson grass (andropogon halepense).
Barley grass (hordeum micronium).
Crab grass (digitaria sanguinalis).
Cocklebur (xanthium pennsylvanicum), all seasons.
N. Cal. black walnut (juglans hindsii).
Wheat and barley.
Cottonwood (populus fremontii).

Summer and Fall:

Russian thistle (salsola kali).
Mugwart (artemisia heterophylla).
West ragweed (ambrosia psilostachya).
Barnyard grass (echinochloa crus-galli).
Bermuda grass (cynodon dactylon).
Biennial wormwood (artemisia biennial).
Indian hair tonic (artemisia dracunculoides).
Povertyweed (iva axillaris).
Mexican tea (chenopodium ambrosioides).
Pigweed (chenopodium album).
Rough pigweed (amaranthus retroflexus).
Tumbleweed (amaranthus graecizans).
Spiny clot bur (xanthium spinosum).
Indian corn (zea mays).
Millet kaffir corn (panicum).
Salt grass (distichlis spicata).
Dock (rumex).

Following are common at Modesto but probably have little to do with hay fever:

Valley Oak (quercus lobata).
Horseweed (erijeron canadense).
Spikeweed (hemizonia pungens).
Virgate tarweed (hemizonia virgate).
Gum plant (grindelia camporum).
Sunflower (helianthus annus).
Telegraph plant (heterotheca grandiflora).
Alfalfa (medicago sativa).

Note—The above shows the general scheme of Botanical surveys of localities, and is given with the hope that it will stimulate others to study further the problems involved in the Hay Fever question in the West.

The botanical survey of the districts is of great value, in that one can more readily determine the probable offender and eliminate unnecessary testing. In some instances, however, it seems to be worth while to use an atmospheric plate or better to have the victim wear a Hitchins campaign button in which is mounted a microscopic cover glass. This is smeared with glycerine and worn in the locality where the hay fever attacks begin. The pollens caught thereon are readily identified by the microscope.

During the past two years we have had collected through the Botanical Department of the University of California, University of Arizona and through the U. S. Agricultural Experimental Station at Logan, Utah, one hundred and forty pollens, many of which have been used in experimental work.

BIOLOGICAL TESTS.

We have followed Goodale's method in the preparation of solutions for testing purposes, except the addition of glycerine, one-half gr. by weight of pure pollen is ground up in a mortar with two drops of glycerine and two drops of normal salt solution for several minutes. Then one drachm of salt solution is added. This is allowed to macerate for several hours when enough alcohol is added to make one-half ounce of 1/16 alcohol by weight. After this has stood for several days the supernatant fluid is withdrawn and put in a sterile amber-colored bottle with a rubber cap. Tests are made on the flexor surface of the forearm, keeping one inch away from the bend of the arm. Wash gently with alcohol and make small scratches about 1½ inches apart and about ⅛ inch long, care being taken not to draw blood. A little, however, makes no difference. The rubber caps are cleaned and a sterile syringe used. A drop is put on the scratch and rubbed gently with a glass rod. Clean the syringe and needle with sterile water and repeat with each solution to be tried. If a reaction occurs, it will appear inside of twenty-five minutes as a hive surrounded by a reddish zone. It may or it may not itch. For purposes of record, ¼ cm. in diameter = +; ½ cm. in diameter = ++; ¾ cm. in diameter = +++; 1 cm. in diameter = ++++.

The reaction showing the largest is the one ordinarily most active and usually the pollen representing this is sprinkled into one nostril in minute quantity. A more or less severe attack of hay fever is produced usually inside of sixty seconds which may last from three to twenty-four hours. This is done as a confirmation of the skin reaction.

SEROLOGY.

The sero-biological work, as done by Goodale, indicates that one pollen from a given order will suffice for all that order. His work on grasses, for instance, is confined to twenty-one, all of which reacted alike. These belong to eight species and eight occur in one species, twenty occur in California.

There are three hundred and twenty-five grasses in this state, fifty-three of which representing the most important, are divided into *eleven* species. It seems to me that a very careful testing of the more important of each of these species should be made, and the same thing done with the Artemisias, Chenopods, and ragweeds before his results can be accepted. While a patient sensitive to grasses may react to several, it has been seen frequently here that some may show one or two very large and intense reactions to the grasses known to grow in the patient's locality and the same patient may react in a lesser degree to a grass not growing in that locality. It would seem more logical to use the grass pollen from the patient's locality and the one giving the more severe reaction rather than the foreign one giving the lesser reaction. The same thing applies to Chenopods, Artemisias and Ambrosias.

During the past eighteen months I have seen seventy-six cases of supposed hay fever. Of this number

53 reacted positively to pollen proteid skin tests,
19 appeared to be due to focal infections,

2 reacted to horse hair proteid alone,
2 reacted to egg albumen alone,
2 showed urinary acidosis not associated with pollenosis.

Of the cases of pollenosis fourteen were treated with pollen extracts; ten began treatment two or three months prior to time of expected attacks. Of these, eight had 90 per cent. relief for the season. The other four were considerably relieved but no doubt were sensitive to other pollens not tried, but which our botanical survey proved to be prevalent in their territory. Two were treated until the end of the season, and naturally, results were not anticipated. Two kept up their treatment indifferently and while benefited somewhat, the result was unsatisfactory. In one instance, the patient, who lives at Klamath Falls, may have been sensitive to other pollens not tried. This can only be determined by either a botanical survey of his district or the identification microscopically of pollens caught on atmospheric plates.

The other case, a resident of Tonopah, was relieved early in the season. He was, however, indifferent as to the time of taking his injections and proved by later skin tests to be sensitive to other things discovered by Professor Hall in his August survey of that territory.

Several observers (Hitchins, Cooke, Koessler and some others) report from 60 to 75 per cent. of their cases cured in various ways. Perhaps this percentage will be higher when the cases are more carefully differentiated as to the causes of the anaphylaxis, pollenosis, food allergy, bacterial sensitization and disturbed endocrine glands, and with a perfected method of preparation and standardization, which will be freed entirely of the possibility of autolysis in the higher dilutions within a period of less than twelve months.

From the seventy-six cases seen, I wish briefly to give the histories of four in order to illustrate the difficulties involved in diagnosing hay fever:

Case 1. Miss G., age 27, resident of Nevada, says usually her attacks occur during August and September, though often in spring, but she has attacks of sneezing all year around. If she got in the dust or near certain flowers, sweet peas, roses, coreopsis, etc., she had attacks and also when she used orris root, face powder and sachet. Of the ingested foods, apples and strawberries seem to disagree with her, and if she eats walnuts she immediately gets an angio-neurotic swelling of the tongue. She was tested with thirty-six different pollens with negative results, tested with thirty-nine food proteins, and showed a marked sensitization to walnuts and slightly to cabbage, peas, cocoa; slight reaction to streptococcus. She gives a history of attacks of yellow discharge from her nose anteriorly and posteriorly principally from the left side. She showed some signs of internal gland disturbance, and was then referred to Dr. Moffitt for further investigation. She was sent back to me with the recommendation that the infection in the sinuses be cleared up. Both antra were opened and drained. Patient referred back to Dr. Moffitt, who put her on ovarian extract, one grain three times per diem.

She reports that she has gone all of her so-called hay fever season without any disturbance and seems to be in better physical condition than she has been for several years.

Case 2. Mrs. ——— consulted me in January, 1916, with a history of frequent attacks of sneezing, itching of eyes and stoppage of nose, and watery discharge. These attacks were so severe that she would soak a kitchen roller towel containing two and one-half yards of material. It was possible to squeeze the secretion from the towel. She had a small pair of tonsils, some bogginess of the tubercles of the septum and also of the middle and lower turbinates. These areas were touched up with a monochloratic acid several times without relief. Calcium salts were given her without relief. Bicarbonate of soda, thirty grains four times a day, was give internally without result, this being given though no acetone was present. Finally in desperation, she was asked what she ate to excess, and replied eggs and grapefruit. The following day she was tested out with the white of egg and grapefruit, and gave a marked reaction to white of egg. Eggs were stopped, which was followed by a 50 per cent. improvement. She was then referred to Dr. Cooper, who reported that the young woman had a small goitre and some symptoms of hypothyroidism. She was put on small doses of thyroid and in a comparatively short time was relieved of all her symptoms. During the past year she has had frequent relapses owing to discontinuance of her thyroid and eating eggs. She has been told that her cure cannot be permanent unless eggs are entirely eliminated from her diet.

Case 3. Mr. L., a baker by occupation, consulted me September, 1916. He complained of difficult breathing with alternating stoppage of the nose; says he sneezes all the year but particularly when he is making bread. He eats a great deal of bread and potatoes. Examination of nose showed a high deflection of the septum. The bony structure of the lower turbinates seemed excessive and the nose unnaturally narrow. He also had large tonsils with cheesy material. These conditions were corrected without apparent relief. Skin tests were made for the grains and he was found active to wheat, barley, rice, potatoes and corn. His starch intake was materially reduced with considerable improvement. I am now contemplating an attempt to build up his immunity with an extract of flour.

Case 4. Doctor R., resident of Reno, has had hay fever so badly for twelve years that he contemplated moving to San Francisco to get away from his trouble. There is no history of asthma, bronchitis, or pneumonia in family. His attacks begin in June, are most severe in August and last until frost. He gets hives from eating melons. The odor of bay rum or eau de quinine makes him sneeze. He eats a great deal of bread, potatoes and rice. Has no trouble in his nose, but has diseased tonsils and a history of chronic appendix.

He gave a skin reaction to several of the chenopod family, sagebrush and ragweed tribes; also a slight reaction to horse-hair proteids; slight reaction to wheat, rice, potatoes and casein. He was given injections of greasewood, mugwort and western ragweed in strengths beginning with 1/50,000 and increased to 1/5,000, and had absolute relief until August 15, when he had a severe attack. I tested him with four additional chenopods, Russian thistle, povertyweed, salt grass and red orache, and obtained reactions. These were added to his solutions and after the first dose complete relief was obtained until the first frost, which is the close of the hay fever season.

One of the principal problems to be met in the future handling of hay fever cases is the attitude of certain manufacturing drug houses who have invaded sections of the west with their pollen vaccines. I refer particularly to the Lederle Antitoxin Laboratory of New York City, which in a circular states:

"1st—Favorable result followed as a prophylactic against hay fever in 83% of cases.

"2nd—In the treatment of hay fever favorable results followed in 89% of the cases.

"3rd—Marked asthmatic symptoms were associated with 55% of the cases. The symptoms were relieved in 84.2% of the cases."

In a personal letter to me they state: "It is a carefully standardized vaccine from the pollens of timothy, red top, June grass, orchard grass, wheat, sorrel, dock, daisy, maize, ragweed, goldenrod, all of which are known to be important factors in causing hay fever in the spring, summer and fall. Hence our vaccine offers protection against each individual pollen mentioned, as well as against all the pollens collectively."

The Mulford Company puts out two preparations, one for the spring type and one for the fall type. Their mixture corresponds botanically to the Lederle. Now compare this list of grasses and plants with the list of flora at Tonopah and Goldfields as follows:

Lederle Pollen Vaccines.	*Flora of Tonopah and Goldfield.*
Timothy,	Russian thistle,
Red top,	Red orache,
June grass,	Spiny salt bush,
Orchard grass,	Greasewood,
Wheat,	Sagebrush,
Sorrell,	Shad scale,
Dock,	Pigweed or lamb's quarters,
Daisy,	Kochia,
Maize,	Hop sage,
Ragweed,	Desert tea,
Goldenrod.	Salt grass,
	Pigweed,

and note that there is no botanical relationship between them. Nearly the same comparison can be made in other sections of the West.

Should not such commercialism be discouraged and some thought be given to develop a method which has for its main object the good of the patient? A preparation to be of value should be made with some thought of the district where it is to be sold. If not, physicians should realize at the start that no uniform results can be looked for.

The results of the work so far indicate:

1st. The value of a careful botanical survey of hay fever districts and a collection of pollens representing the principal flora of that district.

2nd. The necessity of careful biological tests with extracts of pollens from the principal flora and in some instances the use of atmospheric plates to find the unsuspected offender.

3rd. The necessity of removal of all focal infections wherever found, prior to treatment.

4th. The need of team work—i. e., the cooperation of an internist, neurologist, laboratory technician and laryngologist.

5th. That pollen therapy, to quote Hitchins, holds out promise of greater benefit to hay fever victims than any other method of treatment yet suggested.

6th. That treatment should be commenced at least sixty days before the hay fever season begins and should be continued at intervals during the hay fever period of the patient.

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THE COLLOIDAL GOLD (LANGE) TEST IN DIAGNOSIS. U. C. HOSPITAL.

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The readiness with which cerebrospinal fluid is obtained by lumbar puncture has led in recent years to a study of diagnostic methods applied to it. No study of disease of the cerebrospinal nervous system is complete without the valuable evidence derived from the application of the various tests to the cerebrospinal fluid, such as: the Wassermann test, the Noguchi butyric acid test, the Nonne test for globulin, the Fehling's reduction test, and the cell count. In 1912, Lange added to these the colloidal gold test. It is the purpose of this paper to record the application of this test to about one hundred fluids, to show its value as a diagnostic method in diseases of the central nervous system and to emphasize the im-